1. A lithographic method, comprising the steps of:

illuminating a spatial light modulator, said spatial light modulator comprising at least one area array of individually switchable elements;

projecting an image of said spatial light modulator on a photosensitive surface of a substrate;

moving said image across said surface of said substrate;

while said image is moving, switching said elements of said spatial light modulator, whereby a pixel on said photosensitive surface receives, in serial, doses of energy from multiple elements of said spatial light modulator, thus forming a latent image on said surface; and

blurring said image, where said blurring enables sub-pixel resolution feature edge placement.

2. A lithographic method as in claim 1, wherein said blurring comprises defocusing said image.

3. A lithographic method as in claim 1, wherein said blurring is implemented by a diffuser positioned between said spatial light modulator and said substrate.

4. A lithographic method as in claim 1, wherein said blurring comprises adjusting the numerical aperture of projection optics positioned between said spatial light modulator and said substrate.

5. A lithographic method as in claim 1, wherein said blurring is implemented by a microlens array positioned between said spatial light modulator and said

substrate.

6. A lithographic method as in claim 1, wherein said illuminating step comprises continuously illuminating said spatial light modulator.

7. A lithographic method as in claim 1, wherein said illuminating step is implemented by a lamp system comprising an arc lamp.

8. A lithographic method as in claim 1, wherein said illuminating step is implemented by a laser.

9. A lithographic method as in claim 8, wherein said laser is a continuous laser.

10. A lithographic method as in claim 8, wherein said laser is a quasi-continuous laser.

11. A lithographic method as in claim 1, wherein, during formation of said latent image, said projecting step comprises continuously projecting said image of said spatial light modulator on said photosensitive surface of said substrate.

12. A lithographic method as in claim 1, wherein said projecting step is implemented by a telecentric projection lens system.

13. A lithographic method as in claim 1, wherein said spatial light modulator

comprises at least one digital micro-mirror device.

14. A lithographic method as in claim 1, wherein said moving step is implemented by a stage.

15. A lithographic method as in claim 14, wherein said spatial light modulator is carried on said stage.

16. A lithographic method as in claim 15, wherein projection optics is carried on said stage.

17. A lithographic method as in claim 14, wherein said substrate is carried on said stage.

18. A lithographic method as in claim 1, wherein said substrate is a flexible film substrate.

19. A lithographic method as in claim 18, wherein said moving step is implemented by rotatable, spaced apart, axially parallel film drums, said flexible film substrate being wrapped around and tensioned between said drums.

20. A lithographic method as in claim 18, wherein said moving step is further implemented by a stage, said spatial light modulator being carried on said stage.

21. A lithographic method as in claim 20, wherein projection optics is carried on

said stage.

22. A lithographic method as in claim 20, wherein said stage and said substrate move in orthogonal directions to each other.

23. A lithographic tool for patterning a substrate, comprising:

a spatial light modulator, said spatial light modulator comprising at least one area array of individually switchable elements;

a light source configured to illuminate said spatial light modulator;

imaging optics configured to project a blurred image of said spatial light modulator on said substrate; and

an image movement mechanism for moving said image across the surface of said substrate.

24. A lithographic tool as in claim 23, wherein said spatial light modulator comprises at least one digital micro-mirror device.

25. A lithographic tool as in claim 23, wherein said light source is a continuous light source.

26. A lithographic tool as in claim 23, wherein said light source is an arc lamp.

27. A lithographic tool as in claim 23, wherein said light source is a laser.

28. A lithographic tool as in claim 27, wherein said laser is a continuous laser.

29. A lithographic tool as in claim 27, wherein said laser is a quasi-continuous laser.

30. A lithographic tool as in claim 23, wherein said imaging optics is a telecentric projection lens system.

31. A lithographic tool as in claim 23, wherein said imaging optics is configured to form a defocused image of said spatial light modulator.

32. A lithographic tool as in claim 23, wherein said imaging optics comprises a diffuser configured to blur said image of said spatial light modulator.

33. A lithographic tool as in claim 23, wherein said imaging optics has a numerical aperture adjusted such that said image of said spatial light modulator is blurred.

34. A lithographic tool as in claim 23, wherein said imaging optics comprises a microlens array configured to blur said image of said spatial light modulator.

35. A lithographic tool as in claim 23, wherein said imaging optics comprises a single projection lens system.

36. A lithographic tool as in claim 23, wherein said imaging optics comprises a projection lens system for each said area array.

37. A lithographic tool as in claim 23, wherein said image movement mechanism comprises a stage on which said substrate is carried.

38. A lithographic tool as in claim 23, wherein said image movement mechanism comprises a stage on which said spatial light modulator is carried.

39. A lithographic tool as in claim 38, wherein said imaging optics is carried on said stage.

40. A lithographic tool as in claim 23, wherein said image movement mechanism comprises rotatable, spaced apart, axially parallel film drums, said substrate being wrapped around and tensioned between said drums.

41. A lithographic tool as in claim 23, further comprising a control computer configured to control switching said elements of said spatial light modulator while said image is moving across the surface of said substrate.

42. A lithographic tool as in claim 23, further comprising a substrate height measuring system.

43. A lithographic tool for patterning a substrate, comprising:

a spatial light modulator, said spatial light modulator comprising a multiplicity of area arrays of individually switchable elements;

a light source configured to illuminate said spatial light modulator;

a multiplicity of projection lens systems configured to project a blurred image of said spatial light modulator on said substrate; and

an image movement mechanism for moving said image across the surface of said substrate;

wherein the number of said area arrays is greater than the number of said projection lens systems.

44. A lithographic tool as in claim 43, wherein said number of projection lens systems is a submultiple of said number of area arrays.

45. A lithographic method for a substrate, comprising the steps of:

positioning a substrate below a spatial light modulator;

illuminating said spatial light modulator, said spatial light modulator being positioned on a stage, said stage being controlled to move in a patterning direction during exposure of said substrate, said spatial light modulator comprising at least one area array of individually switchable elements, said elements having pitch p, as measured in said patterning direction;

moving said spatial light modulator in said patterning direction at speed v over said substrate;

while said spatial light modulator is moving, projecting an image of said spatial light modulator on said substrate; and

while said image is being projected, switching said spatial light modulator at times separated by a time interval

$T=p/v$

such that a pixel on a photosensitive surface of said substrate receives, in serial,

doses of energy from multiple elements of said spatial light modulator.

46. A lithographic method as in claim 45, wherein said image of said continuously illuminated spatial light modulator is blurred.

47. A lithographic method for a flexible film substrate, comprising the steps of:

moving said flexible film substrate in a patterning direction at speed v;

continuously illuminating a spatial light modulator, said spatial light modulator comprising at least one area array of individually switchable elements, said elements having pitch p, as measured in said patterning direction;

while said spatial light modulator is moving, illuminating said substrate with an image, at magnification M, of said continuously illuminated spatial light modulator; and

while said substrate is being illuminated, switching said spatial light modulator at times separated by a time interval

$$T=pM/v$$

such that a pixel on a photosensitive surface of said substrate receives, in serial, doses of energy from multiple elements of said spatial light modulator;

wherein said moving of said substrate is implemented by rotatable, spaced apart, axially parallel film drums, said substrate being wound around and tensioned between said drums.

48. A lithographic method as in claim 47, wherein said image, at magnification M, of said continuously illuminated spatial light modulator is blurred.

49. A lithographic method, comprising the steps of:

(a) positioning a substrate below a spatial light modulator;

(b) illuminating said spatial light modulator, said spatial light modulator comprising at least one area array of individually switchable elements;

(c) projecting a blurred image, at magnification M, of said spatial light modulator on a photosensitive surface of said substrate;

(d) moving said image in a patterning direction at speed v across said photosensitive surface;

(e) while said image is moving, switching said spatial light modulator after a time interval of

$$T=pM/v$$

where p is the pitch of said elements, as measured in said patterning direction; and

(f) repeating step (e), such that pixels on said substrate receive, in serial, doses of energy from multiple elements of said spatial light modulator, until a desired latent image is formed on said photosensitive surface.

50. A lithographic method, comprising the steps of:

illuminating a spatial light modulator using a light source, said spatial light modulator comprising at least one area array of individually switchable elements;

projecting an image of said spatial light modulator on a photosensitive surface of a substrate;

moving said image across said surface of said substrate;

while said image is moving, switching said elements of said spatial light

modulator at times separated by a time interval;

controlling passage of light along a light path, said light path going from said light source to said spatial light modulator and ending at said substrate; and

blurring said image, where said blurring enables sub-pixel resolution feature edge placement.

51. A lithographic method as in claim 50, wherein passage of light is controlled by a light switching mechanism, said mechanism being operated at the same frequency as, and out of phase with, said elements of said spatial light modulator.

52. A lithographic method as in claim 51, wherein all of said elements of said spatial light modulator are in an off state every other time interval and said switching mechanism is in an off state every other time interval.

53. A lithographic method as in claim 50, wherein passage of light is allowed for a time span which is a fraction of said switching time interval, said image moving a single pixel's length on said substrate surface during said time span.

54. A lithographic method as in claim 53, wherein said time span is a submultiple of said switching time interval.

55. A lithographic method, comprising the steps of:

illuminating a spatial light modulator using a light source, said spatial light modulator comprising at least one area array of individually switchable elements;

projecting an image of said spatial light modulator on a photosensitive surface of a substrate;

moving said image across said surface of said substrate;

while said image is moving, switching said elements of said spatial light modulator at times separated by a time interval; and

controlling passage of light along a light path, said light path going from said light source to said spatial light modulator and ending at said substrate;

wherein passage of light is controlled by a light switching mechanism, said mechanism being operated at the same frequency as, and out of phase with, said elements of said spatial light modulator.

56. A lithographic method as in claim 55, wherein all of said elements of said spatial light modulator are in an off state every other time interval and said switching mechanism is in an off state every other time interval.

57. A lithographic method, comprising the steps of:

illuminating a spatial light modulator using a light source, said spatial light modulator comprising at least one area array of individually switchable elements;

projecting an image of said spatial light modulator on a photosensitive surface of a substrate;

moving said image across said surface of said substrate;

while said image is moving, switching said elements of said spatial light modulator at times separated by a time interval; and

controlling passage of light along a light path, said light path going from said light source to said spatial light modulator and ending at said substrate;

wherein passage of light is allowed for a time span which is a fraction of said switching time interval, said image moving a single pixel's length on said substrate surface during said time span.

58. A lithographic method as in claim 57, wherein said time span is a submultiple of said switching time interval.

59. A lithographic method, comprising the steps of:

illuminating a spatial light modulator using a light source, said spatial light modulator comprising at least two area arrays of individually switchable elements;

projecting images of said area arrays on a photosensitive surface of a substrate;

moving said images across said surface of said substrate; and

while said images are moving, switching said elements of said area arrays, whereby a pixel on said photosensitive surface receives, in serial, doses of energy from multiple elements of said spatial light modulator, thus forming a latent image on said surface;

wherein at least two of said projected images of said area arrays overlap on said substrate.

60. A lithographic method as in claim 59, wherein said area arrays with overlapping projected images on said substrate are switched with the same frequency and are switched out of phase with each other.

61. A lithographic method as in claim 59 further comprising blurring said

images, where said blurring enables sub-pixel resolution feature edge placement.

62. A lithographic method as in claim 59, wherein said overlapping projected images are in register.

63. A lithographic tool for patterning a substrate, comprising:

a spatial light modulator, said spatial light modulator comprising at least one area array of individually switchable elements;

a light source configured to illuminate said spatial light modulator;

imaging optics configured to project a blurred image of said spatial light modulator on said substrate;

a light switching mechanism positioned on a light path, said light path going from said light source to said spatial light modulator and ending at said substrate, said light switching mechanism being configured to control passage of light along said light path; and

an image movement mechanism for moving said image across the surface of said substrate.

64. A lithographic tool as in claim 63, wherein said light switching mechanism is a second spatial light modulator.

65. A lithographic tool as in claim 63, wherein said light switching mechanism is a shutter.

66. A lithographic tool as in claim 63, wherein said light switching mechanism is

integrated with said light source.

67. A lithographic tool for patterning a substrate, comprising:

a first spatial light modulator, said first spatial light modulator comprising at least one area array of individually switchable elements;

a light source configured to illuminate said first spatial light modulator;

imaging optics configured to project an image of said first spatial light modulator on said substrate;

a second spatial light modulator positioned on a light path, said light path going from said light source to said first spatial light modulator and ending at said substrate, said second spatial light modulator being configured to control passage of light along said light path; and

an image movement mechanism for moving said image across the surface of said substrate.

68. A lithographic tool for patterning a substrate, comprising:

a spatial light modulator, said spatial light modulator comprising at least two area arrays of individually switchable elements;

a light source configured to illuminate said area arrays;

imaging optics configured to project images of said area arrays on said substrate, at least two of said images of said area arrays overlapping in register; and

an image movement mechanism for moving said images across the surface of said substrate.

69. A lithographic method, comprising the steps of:

(a) positioning a substrate below a spatial light modulator;

(b) illuminating said spatial light modulator, said spatial light modulator comprising at least one area array of individually switchable elements;

(c) projecting an image, at magnification *M*, of said spatial light modulator on a photosensitive surface of said substrate;

(d) switching said elements of said spatial light modulator at times separated by a time interval *T*;

(e) while said elements are switching, moving said image in a patterning direction across said photosensitive surface at speed

$v=npM/T$

where *p* is the pitch of said elements, as measured in said patterning direction, and n is an integer; and

(f) controlling passage of light along a light path, said light path going from said light source to said spatial light modulator and ending at said substrate, where passage of light is controlled by a light switching mechanism, said mechanism being operated at the same frequency as said elements of said spatial light modulator and shifted out of phase with said elements of said spatial light modulator by a time shift $T(1-1/n)$.

70. A lithographic method as in claim 69, whereby pixels on said substrate receive, in serial, doses of energy from multiple elements of said spatial light modulator, until a desired latent image is formed on said photosensitive surface.

71. A lithographic method as in claim 69, further comprising blurring said image of said spatial light modulator.

72. A lithographic method as in claim 69, wherein all of said elements of said spatial light modulator are in an off state every other time interval and said switching mechanism is in an off state every other time interval.

73. A lithographic method, comprising the steps of:

(a) positioning a substrate below a spatial light modulator;

(b) illuminating said spatial light modulator, said spatial light modulator comprising at least one area array of individually switchable elements;

(c) projecting an image, at magnification M, of said spatial light modulator on a photosensitive surface of said substrate;

(d) switching said elements of said spatial light modulator at times separated by a time interval T;

(e) while said elements are switching, moving said image in a patterning direction across said photosensitive surface at speed

$$v=npM/T$$

where p is the pitch of said elements, as measured in said patterning direction, and n is a constant; and

(f) controlling passage of light along a light path, said light path going from said light source to said spatial light modulator and ending at said substrate, where passage of light is controlled by a light switching mechanism, said mechanism being operated to allow the passage of light for a time span T/n.

74. A lithographic method as in claim 73, further comprising repeating step (f), whereby pixels on said substrate receive, in serial, doses of energy from multiple elements of said spatial light modulator, until a desired latent image is formed on said photosensitive surface.

75. A lithographic method as in claim 73, further comprising blurring said image of said spatial light modulator.

76. A lithographic method as in claim 73, wherein said light switching mechanism is operated to allow the passage of light for one time span T/n per time interval T.

77. A lithographic method as in claim 73, wherein n is an integer.

78. A lithographic method, comprising the steps of:

illuminating a spatial light modulator using a light source, said spatial light modulator comprising at least one area array of individually switchable elements;

projecting an image of said spatial light modulator on a photosensitive surface of a substrate;

moving said image across said surface of said substrate; and

while said image is moving, switching said elements of said spatial light modulator;

wherein the direction of movement of said image is not parallel to columns of pixels in said projected image of said spatial light modulator.

79. A lithographic method as in claim 78 wherein said elements of said spatial light modulator are switched at times separated by a time interval, whereby pixels on said substrate receive, in serial, doses of energy from multiple elements of said spatial light modulator, until a desired latent image is formed on said photosensitive surface.